

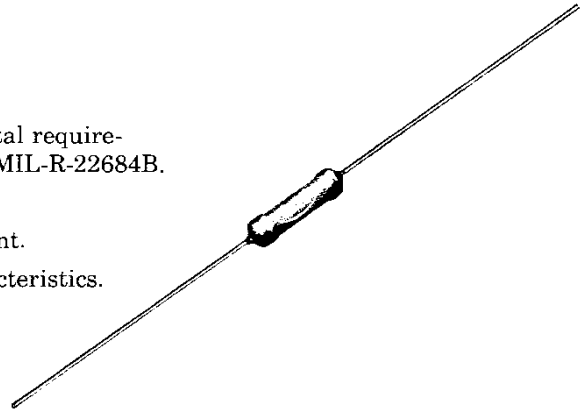


TYPE MFF & CMF COATED METAL FILM Commercial

date 1973

FEATURES

- Small size—conformal coated.
- Meet electrical and environmental requirements of MIL-R-10509F and/or MIL-R-22684B.
- Flame retardant epoxy coating.
- Controlled temperature coefficient.
- Very good high frequency characteristics.
- Low noise.



STANDARD ELECTRICAL SPECIFICATIONS

DALE TYPE	70 C RATING	125 C RATING	WEIGHT (Grams)	MAX. WORKING VOLTAGE
CMF-1/10	1/8 W	1/10 W	.30	250
MFF-1/8	1/4 W	1/8 W	.40	300
CMF-1/8	1/2 W	1/4 W	.55	350
MFF-1/4	1/2 W	1/4 W	.65	350
MFF-1/2	3/4 W	1/2 W	.95	500
CMF-1/4	1 W*	1/2 W	1.00	500
MFF-1	1 W	1 W	2.7	500
MFF-2	2 W	2 W	4.7	750

*With .032 Dia. lead.

Standard tolerances: $\pm 5\%$, $\pm 2\%$, $\pm 1\%$.

TEMPERATURE COEFFICIENT CODE

T.C. CODE	TEMPERATURE COEFFICIENT	TEMPERATURE RANGE
T-00	0 ± 200 PPM/°C	55°C to -175°C
T-0	0 ± 150 PPM/°C	55°C to -175°C
T-1	0 ± 100 PPM/°C	-55°C to -175°C
T-2	0 ± 50 PPM/°C	-55°C to +175°C
T-9	0 ± 25 PPM/°C	-55°C to -175°C
T-3	$0 + 100$ PPM/°C	-55°C to +175°C
T-4	$0 - 100$ PPM/°C	-55°C to -175°C
T-5	0 ± 25 PPM/°C	+25°C to +145°C
T-6	$0 - 50$ PPM/°C	-55°C to -175°C
T-7	$0 - 50$ PPM/°C	55°C to +175°C
T-8	0 ± 35 PPM/°C 0 ± 25 PPM/°C	-55°C to -25°C -25°C to +175°C

RESISTANCE RANGE (Ohms)

DALE TYPE	T-0*	T-1*	T-2	T-9
CMF-1/10	10 Ω -499K	30.1 Ω -499K	30.1 Ω -301K	30.1 Ω -301K
MFF-1/8	10 Ω -1 Meg.	24.9 Ω -1 Meg.	30.1 Ω -499K	30.1 Ω -499K
CMF-1/8	10 Ω -1 Meg.	24.9 Ω -1 Meg.	30.1 Ω -499K	30.1 Ω -499K
MFF-1/4	10 Ω -2 Meg.	24.9 Ω -2 Meg.	30.1 Ω -1 Meg.	30.1 Ω -1 Meg.
MFF-1/2	10 Ω -2.49 Meg.	24.9 Ω -2.49 Meg.	24.9 Ω -1 Meg.	24.9 Ω -1 Meg.
CMF-1/4	10 Ω -2.49 Meg.	24.9 Ω -2.49 Meg.	24.9 Ω -1 Meg.	24.9 Ω -1 Meg.
MFF-1	10 Ω -5.11 Meg.	24.9 Ω -4.02 Meg.	49.9 Ω -2.61 Meg.	49.9 Ω -2.61 Meg.
MFF-2	30.1 Ω -10 Meg.	100 Ω -8 Meg.	100 Ω -6 Meg.	200 Ω -5.11 Meg.

*T-0 and T-1 are available in tolerance of $\pm 5\%$ and greater only.

SPECIAL MODIFICATIONS

- Terminals may be supplied in any commercial material with several type finishes.
- Special pre-conditioning (power aging, temperature cycling, etc.) to customer specifications.
- Non-helixed resistors can be supplied for critical high frequency applications.

SPECIFICATIONS

APPLICABLE MIL-SPECIFICATIONS

MFF and CMF resistors are designed to meet the electrical and environmental requirements of MIL-R-10509F and/or MIL-R-22684B, but they are dimensionally smaller in some cases.

ELECTRICAL

Tolerance: MFF and CMF resistors are supplied in $\pm 5\%$, $\pm 2\%$, $\pm 1\%$, $\pm .5\%$, $\pm .25\%$ and $\pm .1\%$ tolerances. Special tolerance and/or T.C. matching is available on request.

Noise: Dale metal film resistors have exceptionally low noise level. Average for standard resistance range is 0.10 micro-volts per volt over a decade of frequency, with low and intermediate resistance values typically below 0.05 micro-volts per volt.

Voltage Coefficient: Maximum voltage coefficient is 5 PPM per volt when measured between 10% and full rated voltage.

Dielectric Strength: 450 VAC for CMF-1/10; 750 VAC for MFF-1/8 and CMF-1/8; 900 VAC for all others.

Insulation Resistance: 10,000 megohms minimum dry, 100 megohms minimum after moisture test.

MECHANICAL

Terminal Strength: 2 lb. pull test for CMF-1/10, MFF-1/8, CMF-1/8, MFF-1/4 and CMF-1/4. 5 lb. pull test = all others.

Solderability: Continuous satisfactory coverage when tested in accordance with MIL-R-10509F.

MATERIAL

Element: Vacuum deposited nickel-chrome alloy.

Core: Fire-cleaned high purity ceramic.

Coating: Dale-developed flame retardant epoxy, formulated for superior moisture protection.

Termination: Conductive terminating bands are vacuum deposited on each end of resistance element to assure optimum contact between film and press-fit cap. Standard lead material is solder-coated copper.

Weldable Leads: 50 micro-inch gold-plated Dumet leads are available on a standard stocking basis, and can be specified by adding "-52" to the standard model number (Example: MFF-1/8-52). Consult factory for charges on gold-plated Dumet and for information on other materials such as nickel and other special alloys. Lead materials per MIL-STD-1276.

ENVIRONMENTAL

Temperature Coefficient: MFF and CMF resistors are available in 11 standard T.C. codes of which 150 PPM, 100 PPM, 50 PPM and 25 PPM are the most commonly required.

General: Environmental performance is shown in the table below. Test methods are those specified in MIL-R-10509F and MIL-R-22684B.

Shelf Life: Resistance shifts due to storage at room temperature are negligible.

ENVIRONMENTAL PERFORMANCE SPECIFICATIONS

REQUIREMENT	MIL-R-22684B	MIL-R-10509F CHAR. D	MIL-R-10509F CHAR. C	MIL-R-10509F CHAR. E
Applicable Dale T.C. Code	T-00 (200 PPM) T-0 (150 PPM)	T-0 (150 PPM) T-1 (100 PPM)	T-2 (50 PPM)	T-9 (25 PPM)
Power Rating Temperature	70°C	70°C	125°C	125°C
ENVIRONMENTAL TESTS	TYPICAL ΔR	TYPICAL ΔR	TYPICAL ΔR	TYPICAL ΔR
Temperature Cycling	$\pm .15\%$	$\pm .15\%$	$\pm .15\%$	$\pm .15\%$
Low Temperature Operation	$\pm .05\%$	$\pm .05\%$	$\pm .05\%$	$\pm .05\%$
Short Time Overload	$\pm .05\%$	$\pm .05\%$	$\pm .02\%$	$\pm .02\%$
Dielectric Withstanding Voltage	$\pm .01\%$	$\pm .01\%$	$\pm .01\%$	$\pm .01\%$
Effect of Soldering	$\pm .03\%$	$\pm .03\%$	$\pm .03\%$	$\pm .03\%$
Moisture Resistance	$\pm .05\%$	$\pm .05\%$	$\pm .05\%$	$\pm .05\%$
Load Life	$\pm .30\%$	$\pm .10\%$	$\pm .15\%$	$\pm .15\%$
Shock	$\pm .01\%$	$\pm .01\%$	$\pm .01\%$	$\pm .01\%$
Vibration	$\pm .04\%$	$\pm .04\%$	$\pm .04\%$	$\pm .04\%$

POWER RATINGS

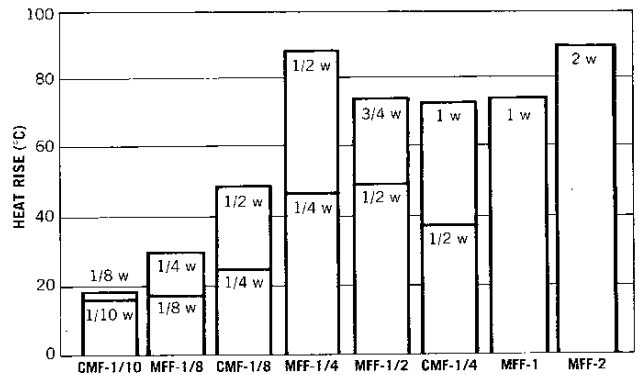
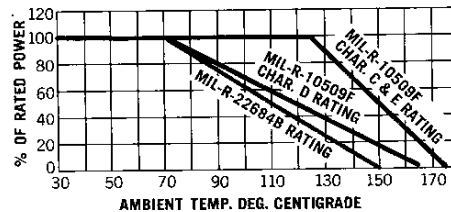
Dale MFF and CMF resistor power ratings are based on full power at temperatures and maximum ΔR as shown in Environmental Performance Table in 1,000 hours load life.

HEAT RISE

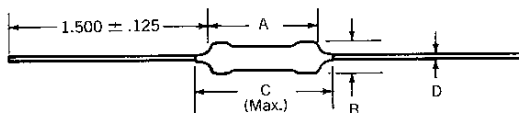
The increase in resistor surface temperature due to the rated load is shown in the chart at the right. Resistor surface temperature = heat rise + ambient temperature.

DERATING

Dale MFF and CMF resistors have an operating temperature range of -65°C to $+175^\circ\text{C}$. They must be derated at high ambient temperatures according to the derating curve.



PHYSICAL CONFIGURATIONS



TYPE	DIM. A	DIM. B	DIM. C	DIM. D
CMF-1/10	.250 ± .031	.095 ± .010	.395	.025 ± .002
MFF-1/8	.343 ± .031	.098 ± .015	.453	.025 ± .002
CMF-1/8	.390 ± .031	.145 ± .015	.525	.025 ± .002
MFF-1/4	.468 ± .031	.125 ± .015	.578	.025 ± .002
MFF-1/2	.562 ± .031	.187 ± .031	.734	.032 ± .002
CMF-1/4	.562 ± .031	.190 ± .015	.687	.025 ± .002
MFF-1	.937 ± .062	.296 ± .031	1.187	.032 ± .002
MFF-2	2.062 ± .062	.296 ± .031	2.312	.032 ± .002

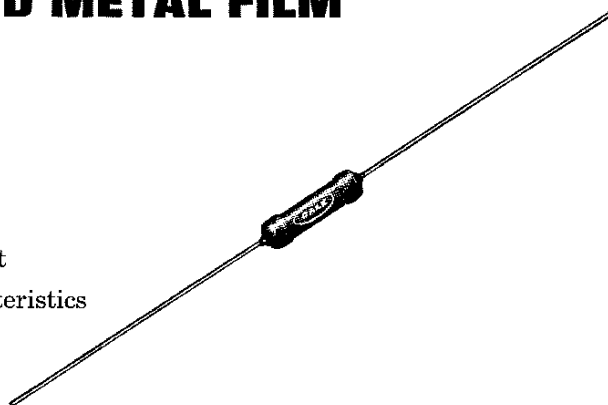


TYPE CMF COATED METAL FILM

MIL-R-22684

date 1973

- Flame retardant epoxy coating
- Controlled temperature coefficient
- Very good high frequency characteristics
- Low noise



STANDARD ELECTRICAL SPECIFICATIONS

DALE TYPE	MIL. TYPE	70°C RATING	MAX. WEIGHT (Grams)	MAX. WORKING VOLTAGE
CMF-07	RL07	1/4 w	.30	250
CMF-20	RL20	1/2 w	.55	350

Tolerance: $\pm 5\%$, $\pm 2\%$ ($\pm 1\%$ available on request).

TEMPERATURE COEFFICIENT CODE

T.C. CODE	MIL. CHAR.*	TEMPERATURE COEFFICIENT
T-00	MIL-R-22684	0 \pm 200 PPM
T-0	—	0 \pm 150 PPM
T-1	—	0 \pm 100 PPM

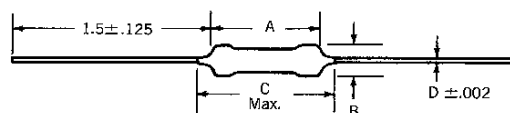
*T-00 is standard. T-0 and T-1 available on request.

RESISTANCE RANGE (Ohms)

1%, 2%, 5%

DALE TYPE	RESISTANCE RANGE
CMF-07	51 Ω to 150K
CMF-20	4.3 Ω to 470K

PHYSICAL CONFIGURATIONS



DALE TYPE	DIM. A	DIM. B	DIM. C	DIM. D
CMF-07	.249 \pm .031	.090 \pm .008	.381 (Max.)	.025 \pm .002
CMF-20	.385 \pm .031	.145 \pm .015	.484 (Max.)	.032 \pm .002

CMF MIL-R-22684
 date 1973

www.33audio.com

SPECIFICATIONS

APPLICABLE MIL-SPECIFICATION

MIL-R-22684B: CMF-07 and CMF-20 resistors meet or exceed the electrical, environmental and dimensional requirements of MIL-R-22684.

ELECTRICAL

Tolerance: CMF-07 and CMF-20 resistors are available in Mil. tolerance G ($\pm 2\%$) or J ($\pm 5\%$). A special tolerance of $\pm 1\%$ is available on request.

Noise: CMF resistors have exceptionally low noise levels. Average for standard resistance range is 0.10 micro-volt per volt over a decade of frequency, with low and intermediate resistance values typically below 0.05 micro-volt per volt.

Voltage Coefficient: Maximum voltage coefficient is 5 PPM per volt when measured between 10% and full rated voltage.

MECHANICAL

Terminal Strength: 5 lb. pull test.

Solderability: Continuous satisfactory coverage when tested in accordance with MIL-R-22684B.

MATERIAL

Element: Vacuum deposited nickel-chrome alloy.

Core: Fire-cleaned high purity ceramic.

Coating: Dale-developed flame retardant epoxy formulated for superior moisture protection.

Termination: Conductive terminating bands are vacuum deposited on each end of the resistive element to assure optimum contact between the film and press-fit cap. Standard lead material is solder coated copper.

ENVIRONMENTAL PERFORMANCE SPECIFICATIONS MIL-R-22684

ENVIRONMENTAL TEST	CMF-07		CMF-20	
	MIL. MAX.	DALE TYPICAL	MIL. MAX.	DALE TYPICAL
Temperature Cycling	$\pm 1.0\%$	$\pm 0.1\%$	$\pm 1.0\%$	$\pm 0.1\%$
Low Temp. Operation	$\pm 0.5\%$	$\pm 0.1\%$	$\pm 0.5\%$	$\pm 0.1\%$
Short Time Overload	$\pm 0.5\%$	$\pm .25\%$	$\pm 0.5\%$	$\pm .25\%$
Dielectric Withstanding Voltage	500 VRMS	750 VRMS	700 VRMS	900 VRMS
Resistance to Soldering Heat	$\pm 0.5\%$	$\pm .25\%$	$\pm 0.5\%$	$\pm .25\%$
Insulation Resistance	100 Meg. min.	10,000 Meg. min.	100 Meg. min.	10,000 Meg. min.
Moisture Resistance	$\pm 1.5\%$	$\pm .25\%$	$\pm 1.5\%$	$\pm .25\%$
Load Life	$\pm 2.0\%$	$\pm 0.5\%$	$\pm 2.0\%$	$\pm 0.5\%$
Shock, Med. Impact	$\pm 0.5\%$	$\pm 0.1\%$	$\pm 0.5\%$	$\pm 0.1\%$
Vibration	$\pm 0.5\%$	$\pm 0.1\%$	$\pm 0.5\%$	$\pm 0.1\%$

POWER RATINGS

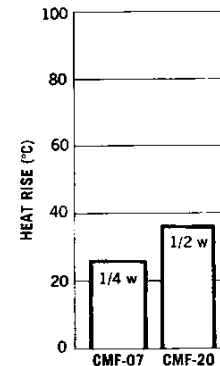
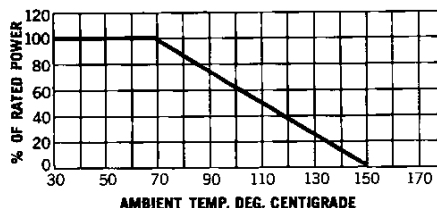
CMF-07 and CMF-20 resistor power ratings are based on full power at 70°C with a maximum ΔR of 2.0% in 1,000 hours load life.

HEAT RISE

The increase in resistor surface temperature due to the rated load is shown in the chart at right. Resistor surface temperature = heat rise + ambient temperature.

DERATING

Dale CMF resistors have an operating temperature range of -65°C to $+150^\circ\text{C}$. They must be derated at high ambient temperatures according to the following derating curve:





TYPE LMF MOLDED METAL FILM Low Value

date 1973

FEATURES

- Very low noise.
- Controlled temperature coefficient.
- Close tracking of temperature coefficient.
- Very good high frequency characteristics.
- Epoxy molded construction provides superior moisture protection.



www.33audio.com

STANDARD ELECTRICAL SPECIFICATIONS

DALE TYPE	125° C RATING	70° C RATING	MAX WT. GRAMS
LMF-1/10	1/10 w	1/8 w	.35
LMF-1/8	1/8 w	1/4 w	.45
LMF-1/4	1/4 w	1/2 w	.84
LMF-1/2	1/2 w	3/4 w	1.6

TEMPERATURE COEFFICIENT CODE

T.C. CODE	TEMP. COEFFICIENT	TEMP. RANGE
T-0	0 ± 150 PPM/° C	-55 to +175° C
T-1	0 ± 100 PPM/° C	-55 to +175° C
T-2	0 ± 50 PPM/° C	-55 to +175° C
T-9	0 ± 25 PPM/° C	-55 to +175° C

Tolerance: ±1%. Special tolerance, temperature coefficient and matching on request.

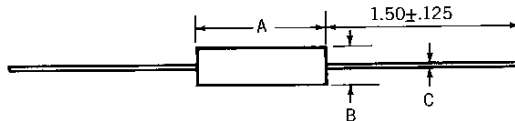
SPECIAL MODIFICATIONS

- Terminals may be supplied in any commercial material with several types of finish.
- Special T.C. matching can be done between pairs or sets and between different as well as identical values and sizes.
- Special close tolerance matching.
- Special pre-conditioning (power aging, temperature cycling, etc.) to customer specifications.

RESISTANCE RANGE (OHMS) 1% Tolerance

	T-0	T-1	T-2	T-9
LMF-1/10	1Ω-9.9Ω	5Ω-30Ω	10Ω-30Ω	15Ω-30Ω
LMF-1/8	1Ω-9.9Ω	5Ω-24Ω	10Ω-30Ω	15Ω-30Ω
LMF-1/4	1Ω-9.9Ω	5Ω-24Ω	10Ω-30Ω	15Ω-30Ω
LMF-1/2	1Ω-9.9Ω	5Ω-24Ω	10Ω-24Ω	15Ω-24Ω

PHYSICAL CONFIGURATIONS



TYPE	DIM. A	DIM. B	DIM. C
LMF-1/10	.260 ± .010"	.095 ± .005"	.025" dia.
LMF-1/8	.406 ± .015"	.135 ± .010"	.025" dia.
LMF-1/4	.593 ± .015"	.203 ± .015"	.025" dia.
LMF-1/2	.730 ± .020"	.250 ± .015"	.032" dia.

SPECIFICATIONS

APPLICABLE MIL-SPECIFICATION

MIL-R-10509: The LMF Series is designed to meet the dimensional, environmental and electrical requirements of MIL-R-10509, except for resistance value.

ELECTRICAL

Tolerance: LMF types are available in $\pm 1\%$ standard tolerance. Special tolerances may be provided on request.

Noise: LMF types have exceptionally low noise which is practically immeasurable on standard noise test equipment.

Voltage Coefficient: Less than 5 PPM per volt when measured between 10% and full rated voltage.

Dielectric Strength: 750 VAC for LMF-1/10 and LMF-1/8. 900 VAC for LMF-1/4 and LMF-1/2.

Insulation Resistance: 10,000 megohms minimum dry, 100 megohms minimum after moisture test per MIL-R-10509. Typical after moisture test is 200,000 megohms.

MECHANICAL

Terminal Strength: 2 lb. pull test for LMF-1/10, LMF-1/8 and LMF-1/4. 5 lb. pull test for LMF-1/2.

Solderability: Continuous, satisfactory coverage when tested in accordance with MIL-R-10509.

MATERIAL

Element: Deposited metal film.

Core: Fire-cleaned high purity ceramic.

Encapsulant: Specially Dale-formulated epoxy molding compound.

Termination: Conductive terminating bands are vacuum-deposited on each end of the resistance element to assure optimum contact between resistive element and press-fit cap. Standard lead material is solder coated copper.

Weldable Leads: Gold-plated Dumet leads are available on a standard stocking basis, and can be specified by adding -52 to the standard model number (Example: LMF-1/4-52). Consult factory for charges on gold-plated Dumet, and for information on other materials such as nickel and other special alloys. Standard solderable and/or weldable leads per MIL-STD-1276.

ENVIRONMENTAL

Temperature Coefficient: 150 PPM/ $^{\circ}$ C, 100 PPM/ $^{\circ}$ C, 50 PPM/ $^{\circ}$ C and 25 PPM/ $^{\circ}$ C are most commonly required. Special T.C.'s may be available on request.

General: Environmental performance is shown in the table below. Test methods are those specified in MIL-R-10509F.

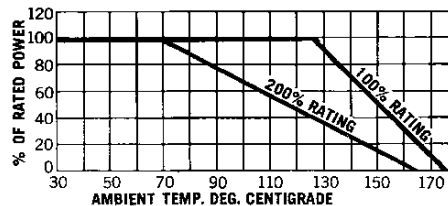
Shelf Life: Resistance shifts due to storage at room temperature are negligible.

ENVIRONMENTAL PERFORMANCE SPECIFICATIONS

	DALE TYPICAL ΔR @ 70 $^{\circ}$ C	DALE TYPICAL ΔR @ 125 $^{\circ}$ C
Temperature Cycling	$\pm 0.10\%$	$\pm 0.10\%$
Low Temp. Operation	$\pm 0.05\%$	$\pm 0.05\%$
Short Time Overload	$\pm 0.02\%$	$\pm 0.02\%$
Dielectric Withstanding Voltage	$\pm 0.01\%$	$\pm 0.01\%$
Effect of Soldering	$\pm 0.02\%$	$\pm 0.02\%$
Moisture Resistance	$\pm 0.05\%$	$\pm 0.05\%$
Load Life	$\pm 0.05\%$	$\pm 0.15\%$
Shock	$\pm 0.01\%$	$\pm 0.01\%$
Vibration	$\pm 0.01\%$	$\pm 0.01\%$

DERATING

Dale LMF resistors have an operating temperature range of -65° C through $+175^{\circ}$ C. They must be derated according to the following curves:

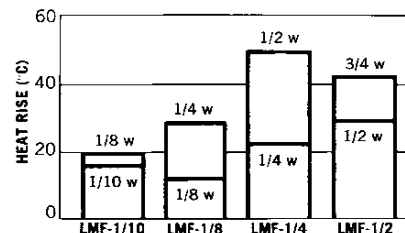


POWER RATING

Dale LMF resistors have two power ratings, depending on operating temperatures of 70° C and 125° C. Both are based on a maximum ΔR of 0.5% in 1000-hour load life.

HEAT RISE

The increase in resistor surface temperature due to the rated load is shown in the chart at right. Resistor surface temperature = heat rise + ambient temperature.



Types MFF MF CMF
date 1973

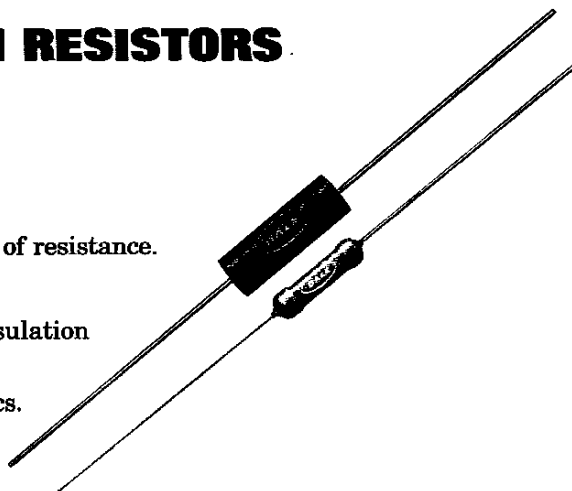
www.33audio.com

Dale

LOW T.C. METAL FILM RESISTORS

FEATURES

- Extremely low temperature coefficients of resistance.
- Small size.
- Dale-developed coated or molded encapsulation provides superior moisture protection.
- Very good high frequency characteristics.
- Low noise characteristics.



STANDARD ELECTRICAL SPECIFICATIONS

DALE TYPE	125°C RATING	WEIGHT (Grams)	MAX. WORKING VOLTAGE
CMF-1/10 MFF-1/8 MF-1/8	1/8 watt	.40 max.	250 volts
CMF-1/8 MFF-1/4 MF-1/4	1/4 watt	.65 max.	350 volts
MFF-1/2 MFS-1/2	1/2 watt	.95 max.	500 volts

TEMPERATURE COEFFICIENT CODE

T.C. CODE	TEMPERATURE COEFFICIENT	TEMPERATURE RANGE °C
L-1	0 ± 20 PPM/°C	0 to +80
L-2	0 ± 15 PPM/°C	0 to +80
L-3	0 ± 10 PPM/°C	0 to +80

Standard tolerances: 1%, .5%, .25% and .10%.
Special tolerances on request.

RESISTANCE VALUE RANGES

STYLE	L-1 (0 ± 20 PPM)	L-2 (0 ± 15 PPM)	L-3 (0 ± 10 PPM)
CMF-1/10 MFF-1/8 MF-1/8	30.1Ω to 300KΩ	49.9Ω to 200KΩ	100Ω to 100KΩ
CMF-1/8 MFF-1/4 MF-1/4	30.1Ω to 499KΩ	49.9Ω to 300KΩ	100Ω to 200KΩ
MFF-1/2 MFS-1/2	30.1Ω to 750KΩ	49.9Ω to 500KΩ	100Ω to 400KΩ

SPECIFICATIONS:

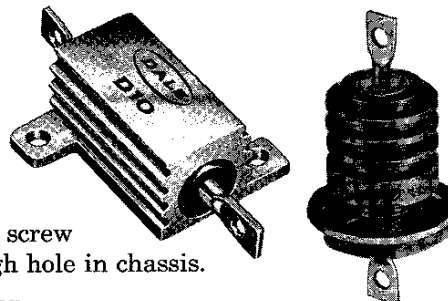
Dale low temperature coefficient metal film resistors meet or exceed all the requirements of MIL-R-10509F when limited to the specified temperature range of 0 to +80°C. For complete environmental and dimensional information, see pages 58 thru 60.

Dale
date 1973

TYPE D & P HOUSED POWER FILM

FEATURES

- High stability
- Wide resistance range
- Molded in aluminum housing
- Utilize heat-sink effect of chassis. Type D screw mounts on chassis. Type P mounts through hole in chassis.
- Flat marking surface for easy identification
- Low reactance at high frequencies
- Molded construction with complete environmental protection



STANDARD ELECTRICAL SPECIFICATIONS

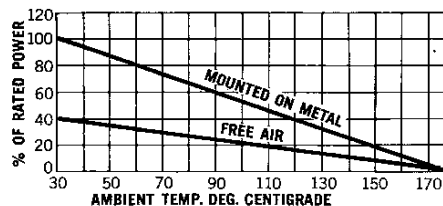
DALE TYPE	POWER RATING	RESISTANCE** RANGE	MAX. WORKING VOLTAGE	STANDARD TEMPERATURE COEFFICIENT†
D5	4W	50Ω-1 Meg.	500V	±25 PPM/°C (T-9) and ±50 PPM/°C (T-2)
D10	8W	50Ω-2 Meg.	600V	
D15	12W	50Ω-2.6 Meg.	700V	
P8, P8A*	8W	30Ω-2 Meg.	600V	

*Type P8A has single terminal, chassis grounded. **Consult factory for higher or lower resistance values.
†Consult factory for special temperature coefficient requirements

POWER RATING

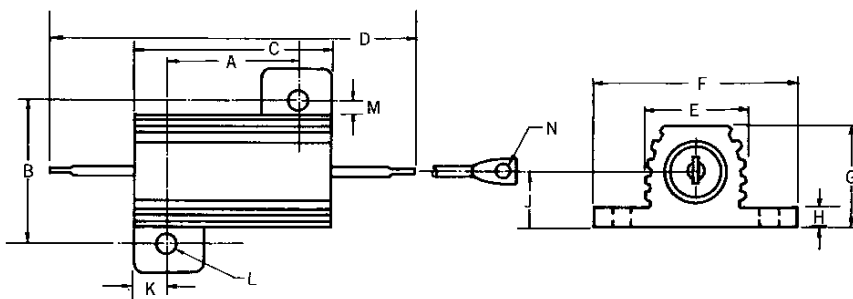
Dale D and P resistor ratings are based on the following requirements:

1. 175° C maximum internal hotspot temperature.
2. 1% maximum ΔR in 1000 hour load life.
3. Recommended minimum heat sink:
4"x6"x.040" aluminum chassis = D5, D10, P8, P8A
5"x7"x.040" aluminum chassis = D15



DERATING

Dale D and P resistors have an operating temperature range of -55°C to +175°C. Derating is required for reduced chassis mounting area and for high ambient temperatures.



TYPE D DIMENSIONS

TYPE	A	B	C	D	E	F	G	H	J	K	L	M	N
D5	.444 ±.005	.490 ±.005	.600 ±.031	1.125 ±.062	.334 ±.015	.646 ±.015	.320 ±.015	.065 ±.010	.133 ±.010	.078 ±.010	.093 ±.005	.078 ±.015	.050 ±.005
D10	.562 ±.005	.625 ±.005	.750 ±.031	1.375 ±.062	.420 ±.015	.800 ±.015	.390 ±.015	.075 ±.010	.165 ±.010	.093 ±.010	.093 ±.005	.102 ±.015	.086 ±.005
D15	.719 ±.005	.781 ±.005	1.062 ±.031	1.938 ±.062	.550 ±.015	1.080 ±.015	.546 ±.015	.088 ±.010	.231 ±.010	.172 ±.010	.125 ±.005	.115 ±.015	.086 ±.005

SPECIFICATIONS

ELECTRICAL

Tolerance: ±0.1%, 0.25%, 0.5%, 1% and 2% are standard.

Noise: Dale D Series resistors have exceptionally low noise level. Average for standard resistance range is 0.10 micro-volt per volt over a decade of frequency, with low and intermediate resistance values typically below 0.05 micro-volt per volt.

Voltage Coefficient: Maximum voltage coefficient is 5 PPM per volt when measured between 10% and full rated voltage.

Dielectric Strength: 1000 VAC on D5 and P8, 1500 VAC on D10, 2000 VAC on D15. Not applicable to P8A because of grounding to chassis.

Insulation Resistance: 10,000 megohms minimum dry, 100 megohms minimum after moisture test. Typical after moisture test is 200,000 megohms. Not applicable to P8A because of grounding to chassis.

ENVIRONMENTAL

Temperature Coefficient: D and P Series resistors are available in 11 standard T.C. codes of which 150 PPM, 100 PPM, 50 PPM and 25 PPM are the most commonly required.

MECHANICAL

Terminal Strength: 2 lb. pull test = D5, P8, P8A
 5 lb. pull test = D10
 10 lb. pull test = D15

Solderability: Satisfactory when tested in accordance with Method 208 of MIL-STD-202.

MATERIAL

Core: Fire-cleaned high purity ceramic

Element: Vacuum-deposited nickel-chrome alloy

End Caps: Stainless steel

Sealant: Specially Dale-formulated epoxy molded construction.

Housing: Aluminum with hard anodic coating

Standard Terminals: Tinned Copperweld

ENVIRONMENTAL PERFORMANCE SPECIFICATIONS (MIL-R-10509)

REQUIREMENT	CHAR. D		CHAR. C		CHAR. E	
	MIL. MAX.	DALE TYP.	MIL. MAX.	DALE TYP.	MIL. MAX.	DALE TYP.
Temperature Cycling	±0.5% Δ R	±0.10%	±0.25% Δ R	±0.1%	±0.25% Δ R	±0.10%
Low Temp. Operation	±0.5% Δ R	±0.05%	±0.25% Δ R	±0.05%	±0.25% Δ R	±0.05%
Short Time Overload	±0.5% Δ R	±0.10%	±0.25% Δ R	±0.10%	±0.25% Δ R	±0.10%
Dielectric Withstanding Voltage	±0.5% Δ R	±0.01%	±0.25% Δ R	±0.01%	±0.25% Δ R	±0.01%
Effect of Soldering	±0.5% Δ R	±0.05%	±0.1% Δ R	±0.05%	±0.1% Δ R	±0.05%
Moisture Resistance	±1.5% Δ R	±0.25%	±0.5% Δ R	±0.25%	±0.5% Δ R	±0.25%
Load Life	±1.0% Δ R	±0.5%	±0.5% Δ R	±0.5%	±0.5% Δ R	±0.5%
Shock	±0.5% Δ R	±0.01%	±0.25% Δ R	±0.01%	±0.25% Δ R	±0.01%
Vibration	±0.5% Δ R	±0.01%	±0.25% Δ R	±0.01%	±0.25% Δ R	±0.01%

TYPE P DIMENSIONS

